

Atkinson (I E.)

THE ETIOLOGY
OF
CONGENITAL SYPHILIS,

HISTOLOGICALLY CONSIDERED.

BY

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THE ETIOLOGY OF CONGENITAL SYPHILIS, HISTOLOGICALLY CONSIDERED.¹

CONGENITAL syphilis is described by the various writers upon the subject as having its origin in three possible modes. These are: 1. Through the male element of impregnation; 2. Through the female element of impregnation; and, 3. Through the circulation from the mother, consequent upon the nutritive processes of utero-gestation. There is, however, by no means a unanimity of opinion among these authors as to the relative frequency of these modes, and there are not wanting those who utterly deny the validity of one or the other of them.

The theory of infection through the maternal circulation manifestly lays claim to a greater facility of demonstration than either of the other two; thus, all its requirements would be fulfilled by cases such as the following hypothetical one: A woman, never having had a previous syphilitic lesion, at some time subsequent to her impregnation acquires the initial ulcer; her child, born alive, subsequently exhibits symptoms that are undoubtedly syphilitic.

Simple and plain as these requirements seem to be, the number of cases reported in favor of this theory of foetal con-

¹ Read before the Baltimore Pathological Society, November 13, 1874.

tamination is astonishingly few. Diday gives details of cases ("Syphilis in Infants," New Sydenham Society's Translation, pages 29-31), two of which, only, it seems to me, are unobjectionable; these are as follows: "Mr. P——, after having had a primary sore for some days, had connection with his wife, when she was in the seventh month of pregnancy, and gave her a similar sore. Baumès treated them both with Van Swieten's drops and sudorifics. The mother had, nevertheless, copper-colored papulæ on her forehead and ulceration of her tonsils. She was delivered of a child, apparently healthy, which was given to nurse to a young woman, in whom, when examined most minutely by Baumès, no disease was discovered. At the end of thirteen days the child had pustules of syphilitic ecthyma on the buttocks, chest, and cheeks. It was cured by mercurial treatment."

"P. Dubois has published the case of a young woman, aged nineteen, who contracted, at the fifth month of pregnancy, a primary sore on the lower lip, which was soon followed by general symptoms. She was delivered of a child, which died on the eighth day with pemphigus and sanguineous infiltration of the lungs."

Lancereaux, however, does not hesitate to reject even these cases, and will not allow this mode of contamination; and the very paucity of instances recorded in its favor would certainly seem to give him some justification for his opinion.

The potency of the germ-cell or ovum as the carrier of the contagious element has certainly been assumed upon entirely insufficient grounds; for, admitting the liability to foetal infection through the circulation of the mother, it becomes impossible to decide, upon any amount of inductive evidence whatsoever, whether or not an instance of congenital syphilis, derived from the mother, can be ascribed to any other source of contagion. In a word, no number of accumulated facts, relative to the transmissibility of syphilis to the foetus, by a mother, herself the subject of the disease prior to impregnation, can, in the smallest degree, enlighten us as to whether her disease was transmitted through the ovum or through the circulation.

The male element of reproduction, however, it has been

claimed, may be proved to be the direct vehicle of syphilis to the embryo, and that by the assistance of two lines of evidence, as follows: 1. A father having syphilis, either manifesting itself or existing potentially, yet latent at the moment of impregnation, may, through his semen, convey the virus of the disease to the embryo, the final result being the extrusion of a syphilitic child, the mother remaining healthy, although never having previously suffered from syphilis. 2. A mother, never having had syphilis, in due time after her impregnation by a syphilitic father, exhibits, without the previous occurrence of an initial lesion, symptoms of constitutional disease, derived from her foetus.

Now, could either of these lines of evidence be proved, there would no longer remain any doubt about the question: we should be obliged to accept, as established, the theory of direct paternal transmissibility of syphilis. But what are the facts? Concerning the recorded cases adduced as settling the first proposition, by some of the very first syphilographers, such as Hutchinson, Diday, Vidal (de Cassis), Lancereaux, Ricord, Langston Parker, and others, most of their weight is due, not to their own intrinsic value, but to the eminent celebrity of their foster-parents; for, when we come to an examination of these evidences, supposed to be conclusive, we must be overwhelmed with the sense of their insufficiency. Thus, although symptoms of constitutional syphilis in the mother have not obtruded themselves upon the notice of the observers, certainly sufficient care was not taken to establish her freedom from the disease; furthermore, most of the cases, even as reported, justify the gravest suspicions as to the physical condition of the mothers, who either had certain lesions which were not regarded as specific, or else whose histories are lamentably deficient: the great majority of cases being so obviously devoid of definiteness of detail and scientific exactness of observation that they cannot for a moment be entitled to serious consideration. Even those cases which have been worked up with care and elaboration are singularly incomplete and unconvincing.

As, however, the object of this paper is not to disprove the theory of the transmissibility of syphilis through either the

sperm or germ cells, but rather to cast discredit upon the evidences heretofore considered sufficient proof, and to offer other and more philosophical reasons for believing that such transmissibility is both possible and probable, I do not at this time propose to discuss in detail the cases supposed to be corroborative. For this purpose, I cannot do better than to refer the inquirer to a paper contributed by Dr. F. A. Sturgis to the *NEW YORK MEDICAL JOURNAL* for July, 1873, entitled "The Etiology of Congenital Syphilis." In it, in denying the possibility of transmission through the sperm-cell, and in reviewing the records upholding the theory, the author remarks: "In selecting cases for criticism, I have copied from those whom I believe to be the best and most trustworthy defenders of this doctrine, from such men as Hutchinson, of London; Langston Parker, of Birmingham; Diday, of Lyons, and others of equal weight. The result of this critical examination of cases is, it seems to me, the successful demonstration of their untrustworthiness." My own researches lead me to the conclusion that there are no instances to be found which will bear the close scrutiny required by the importance of the subject. The reporters have been, for the most part, content with the assertions of the woman or her friends, or there is no mention of more than a single examination having been made, or those important inquiries as to the immunity afforded the woman by a former attack of the disease, or as to its latency, are lacking, or else the subsequent history is not noted. That these objections are not captious must appear when we consider the great obscurity of symptoms occasionally experienced in syphilis, especially in women, or their insignificance, so that their evolution may have escaped attention, or the occasional inactivity of the disease; for, if a term of years may intervene between outbreaks of the malady (and this has been noted in cases in which the father was claimed to be the sole source of foetal infection, when years had elapsed since the last manifestations in his own person),¹ then may we not be undoubtedly justified in demanding the strictest attention to

¹ See Diday, "Infantile Syphilis," New Sydenham Society's Translations, pp. 17, 18; also Lancereaux, New Sydenham Society's Translation, vol. ii., p. 225.

every possible detail of research ; and may we not be allowed, at least, to suspect an existence of syphilis, potentially, in the system of the mother, who to all external appearances has been, and continues at the time of observation, a healthy woman ?

So long ago as 1837, Colles, of Dublin, observed a fact which will go far toward destroying the credibility of those cases in which mothers are said to have given birth to syphilitic children, themselves remaining unaffected. This observation is as follows : *There has never occurred a single instance in which a congenitally syphilitic child infected its own mother (extra-utero) ; per contra, very many nurses have acquired chancres of the breast and consequently constitutional syphilis from contact with the specific sores of their nurslings.* So far as I have been able to ascertain, there is to this day no mention of a single exception to this rule. Surely, if the mothers who themselves nurse their offspring affected with constitutional syphilis (and, doubtless, they nurse them far more frequently than they allow them to be nursed by others), are not protected from contagion by the previous or actual existence of the poison in their own systems, we would have a fearful array of such instances. This fact must surely tend to throw the greatest doubt over the evidence afforded us by many recorded but imperfectly-observed phenomena.

Let it be remembered, however, that Colles's observation has no bearing upon the question of paternal transmissibility. It merely casts great discredit upon that evidence, *supposed* to favor the theory, which would persuade us that a syphilitic child may be born of a healthy mother. Aside from the strong negative evidence afforded by such observations as those of Colles, and the great want of accuracy and trustworthiness in the recorded cases of claimed direct paternal transmission (mother escaping), it must appear extremely improbable, in view of the intimate connection between the mother and child during gestation, that a woman can carry an embryo to full term, indued with syphilis by the male element of impregnation, herself escaping infection.

There remains to be considered the second series of proofs of direct paternal transmission of syphilis to the foetus ; that

is, the instances in which women are said to become syphilitic only subsequent to their impregnation by a spermatozoid syphilitically infected. The difficulties attending the ascertainment of the existence of syphilitic lesions of the female genitals are notoriously great, and it is a fact familiar to every one in the habit of treating syphilitic persons, that in a large proportion of cases all knowledge of symptoms, preceding the constitutional ones, is honestly disclaimed by both males and females. Moreover, the symptoms of constitutional syphilis, especially the early ones, are very frequently overlooked or misunderstood. It is not claimed that such modes of infection do not occur, but only that the uncertainty and obscurity that necessarily involve them debar their being accepted as authentic and conclusive, or as more than corroborative of more exact data.

Granting the unreliability of the evidence usually adduced and accepted as proving the syphilis-carrying qualities of either ovum or spermatozoid, there remains no direct proof determining whether the disease may be communicated to the embryo by means of either reproductive element, or exclusively during the process of nutrition, subsequent to impregnation; nevertheless, believing that a foetus may become contaminated by any one of the asserted modes of infection, it is necessary that I should state my reasons for entertaining this view.

Abandoning the method of searching for light by the routes that have been so frequently and unsatisfactorily traveled, it seems to me that the promise of success is from the consideration of—1. The histology of the elements essential to reproduction and the nutrition of the foetus. 2. The nature of the specific poison or virus of syphilis. 3. The mode in which this virus produces its peculiar morbid action upon the tissues.

The consideration of the first subject of inquiry offers us a field that has been tolerably well worked; and incorporated with the results of the laborers therein, is a good deal that seems certain, more that seems probable. In the first place, it has been ascertained as a fact that the reproductive cells, both male and female, are the product of epithelium; that they are, in fact, epithelial cells.

In the lower orders of the animal kingdom this is especially apparent. Waldeyer states ("Stricker's Manual," New Sydenham Society's Translation, vol. ii., page 188) that the ova of ascaridæ proceed from the epithelial cells of the ovarian tube; that (id., p. 189) from the hermaphrodite glands of certain mollusca, even in the same follicles, both ova and seminal corpuscles are found, which proceed from the epithelial cells lining the glandular follicles. At page 190 of the same volume is presented a diagram of the ovarian tube of *Vanessa urtica*, in which the various stages of development of epithelial cells, and the selection of certain of their number, and their further elaboration into ova, are represented. "In the common polyp, sperm-cells and germ-cells are developed in the same layer of indifferent tissue;" and in one of the sponges, Huxley observes that they are mingled together in the general parenchyma (Herbert Spencer, "Principles of Biology," vol. i., page 222, American edition). Waldeyer, in the monograph already referred to, also demonstrates by text and diagram, in the foetal vertebrate, the evolution of Graafian follicles and ova from the epithelium of the ovary; and his general conclusion regarding the origin of the ova is as follows: "In all classes of animals they seem to be more highly-developed epithelial cells of the ovary, that have undergone some peculiar modification, so that the follicular epithelium and the egg-cells stand in direct genetic relation."

From what has already been said, the same generalization may be inferred to hold good concerning the sperm-cells. Owsjannikow ("Stricker's Manual," vol. ii., p. 155) supplies us with valuable evidence upon this point. He observed in the testes of the Salmonidæ the development, from the cells of the epithelium, of the young spermatozoids. La Valette St. George, not denying and not affirming that these cells are epithelial, declares them to be uni- and multi-nucleated cells. There need be, however, no further adduction of proofs in this paper bearing upon the epithelial origin of the reproductive cells, since biologists are generally agreed upon the subject.

The next question that arises is, To what extent are these cells differentiated, or more highly developed than ordinary

epithelium cells? Although Waldeyer has just been quoted as expressing the opinion that they are "more highly-developed epithelial cells," other investigators, of no less authority, do not hesitate to declare their conviction that the sperm and germ cells have no special "elaboration fundamentally different from all other cells." Space will not allow such an investigation of this subject as its interest might demand; but I think I certainly can, in this place, do no better than refer to the remarks of Mr. Herbert Spencer, concerning this question, and quote somewhat extensively some of them occurring at page 221, vol. i., "Principles of Biology," American edition. His words are: "If, by way of demurrer to this view, it is asked, why other epithelium-cells do not exhibit like properties, there are two replies: The first is, that other epithelium-cells are usually so far changed to fit them to their special functions, that they are unfitted for assuming the reproductive function. The second reply is, that in some cases, where the epithelium-cells are but very little specialized, they *do* exhibit the like properties; not, indeed, by uniting with other epithelium-cells to produce new germs, but by producing new germs without such union. I learn from Dr. Hooker that the *Begonia phyllomanica*^{*asa*}~~*asa*~~ habitually develops young plants from the scales of its stem and leaves—nay, that many young plants are developed by a single scale. The epithelium-cells comprising one of these scales swell here and there into large globular cells; from chlorophyll in their interiors, shoot out rudimentary axes; and then, by spontaneous constrictions, they cut themselves off, drop to the ground, and grow into Begonias. . . . Thus, there is no warrant for the assumption that sperm-cells and germ-cells possess powers fundamentally unlike those of other cells. The inference to which the facts point is, that they differ from the rest mainly in not having undergone modifications such as those by which the rest are adapted to particular functions. They are cells that have departed but little from the original type. Or, in the words suggested by a friend, it is not that they are peculiarly specialized, but rather that they are unspecialized; such specializations as some of them exhibit in the shape of locomotive appliances, etc., being interpretable not as intrin-

sic but as extrinsic modifications, that have reference to nothing beyond certain mechanical requirements."

From all these considerations it must be seen that, from the essential similarity of origin and history of the reproductive cells, *whatever susceptibilities to impressions from without are possessed by one, the other must be capable of.*

This proposition cannot be invalidated by the asserted fact that these reproductive cells, in man, are stated with much appearance of probability (the germ-cell especially) to be formed during an early period of embryonic life, and only then; for, this is true, in the first instance, of the germ-cell, only in so far as is meant the primordial ovum, consisting of a nucleus or germinal vesicle embedded in the surrounding mass of protoplasm: the zona pellucida, or vitelline membrane, forming with its contents what may be termed the mature ovarian ovum (Waldeyer), being a product of the follicular epithelium, either directly, or from the cell-nutrition resulting in the formed material of Beale, and not existing until the ovum is about to be set free by the functional activity of the surrounding parts. So, too, it may be said of the spermatozoid, that its condition, ~~however~~ inactive, was, prior to its assuming the form recognized ~~as~~ the mature male element of reproduction, that of an epithelial cell; these changes being of course consequent upon nutrition, are accompanied by additions to and subtractions from the preëxisting mass; so that it appears that, notwithstanding the early date of formation of these cells, they must remain, during their entire existence, subject to impulses from without.

Having indicated the origin of the reproductive cell in the epithelium-cell, for the purpose of ascertaining the virus-carrying capacity of either of these, it becomes necessary to discover whether or not there be any histological community of nature between them and those particles which, in the organism, are the carriers and distributors of the virus of syphilis.

Our knowledge of histology, as it exists to-day, does not justify a positive assertion of the possibility of tracing the relationship; for we lack definite information as to the most vital point of the argument, viz., the precise characteristics of the virus itself; so, also, is it not universally admitted that

the genealogy of the epithelium-cell can be traced out. But enough is known to entitle one to the confident belief that such relationship will be proved to the satisfaction of all investigators as completely as it is now to the few who claim to have established it. The consideration of this question will consist in the citation of the facts and observations (that have been available) in favor of the theory of the derivation of the epithelium, and consequently the reproductive cell, from the wandering cell, the white blood-corpuscle and lymph-cell.

On page 39, of volume i., New Sydenham Society's Translation of "Stricker's Manual of Histology," the editor (Stricker) thus states the conviction of great histologists regarding the nature of epithelium-cells: "The development of epithelia from the cells of the connective tissue has already been maintained by many, by Burekhardt, by Virchow, and by Förster. Very recently Pagenstecher has stated that they proceed from exudation-corpuscles; and Biesiadecki says specifically that they come from the colorless blood-corpuscles;" and, at page 38 of the same volume, he so far gives in his adhesion to the theory as to say: "It is even conceivable that the colorless blood-corpuscles are destined for the regeneration of the tissues of the animal body. Nor can any solid objection to this view be raised from the stand-point gained by a knowledge of the history of development. The blood proceeds, indeed, from a different germinal lamina to the epithelia, for example; but primarily all cells proceed from the segmentation spheres, and these again from the fertilized ovum. Lastly, who can determine what influences must be in operation to cause a segmentation spheroid to become an epithelial cell, and whether similar influences may not also act on young cells in the post-embryonal period?"

According to Biesiadecki the wandering cells exist normally in the rete mucosum, becoming more numerous in pathological conditions (pointed condylomata, eczema, etc.), and Pagenstecher claims that he can demonstrate transition forms from these ambulant to epithelial cells, and concludes that, therefore, the migrating cells become epithelial cells.—*Newmann*, "*Handbook of Skin Diseases*," American edition, p. 171.

As already stated, this theory of the development of the wandering cell into the epithelial cell has by no means met with universal acceptance; but sufficient facts are available to justify its adoption, provisionally, trusting to time and extended observation to definitely establish it. At all events, the various stages from the leucocyte to the wandering cell, and from the epithelium to the reproductive cell, have been pretty satisfactorily determined. (Also may we safely believe the statement of Recklinghausen, to the effect that the leucocyte is also the progenitor of the red blood-corpuscle.)

Passing by for the moment the discussion of the carriers of the syphilitic virus, it may be well to appropriately ascertain what may be the nature of the thing carried, that is, the virus itself. According to Mr. Hutchinson, syphilis must be regarded as one of the zymotic fevers; and this view, probable as it is, has met, on the part of syphilographers, with a strong disposition to its acceptance; certainly with no very decided opposition. Now, although the virus of syphilis has not been demonstrated to the eye or other senses (Lostorfeo's claim of discovery of syphilitic corpuscles in the blood having proved not well founded), there exists great reason to consider it as consisting of solid particles. Successful inoculations have only been obtained through the use of virus containing solid or corpuscular elements. But, although no actual demonstration of the virus of syphilis has, as yet, been attained, we have more positive information regarding that of other specific diseases: thus, the active principle of the vaccine disease has been recognized and separated from the mass of fluid; likewise the poisonous principle of glanders, of farcy, and of small-pox. These discoveries are for the most part due to the investigations of M. Chauveau, of Lyons, of Dr. Burdon-Sanderson, and of Dr. Beale.

This recognition of the active agents in the causation of zymotic diseases has been followed by very decided differences of opinion as to their essence: whether they are organisms, independent in their life and continuing their like by simple growth and reproduction, or merely "detached particles of a living organism" (Ross), or, in other words, detached portions of cells. Do they induce disease by a multiplication of them-

selves at the expense of the organism, or do they impress with their own morbid molecular motion those parts of the body similar in nature to themselves and with which they unite? Whatever may be the nature of these bodies containing the active principles of zymotic diseases, investigators are pretty well agreed that it is through the corpuscular elements of the organism that they perform their offices; that in the blood and lymph tracts the leucocytes and lymph-cells (of which Recklinghausen says, "The lymph-corpuscles are now universally admitted to be identical in all their characters with the colorless corpuscles of the blood"), and their descendants in the tissues, are either used up as the pabulum of these "independent organisms," or, as is ably and convincingly argued by Dr. James Ross, in his work upon the "Graft Theory of Disease," they must unite with the "detached portions of a living organism," after the manner of the reproductive cells, and acquire from them a perverted molecular motion, which evidences itself by the resulting symptoms of the special zymotic disease.

Assuming the accuracy of these conclusions of different writers concerning the origin of both germ and sperm cell in the epithelium-cell, and of this latter in the leucocyte, which is declared to be the contagium-bearer of the human blood (and, in the present state of science, evidences are daily accumulating in support of them), the following deductions may legitimately be drawn.

1. A syphilitic mother may primarily infect an ovum, which may subsequently become impregnated:

2. She may, the ovum escaping, subsequently infect the embryo through the bioplastic elements of her own blood, during the process of nutrition.

3. A syphilitic father may also, through the sperm-cell, infect the germ-cell impregnated by it, the result being a syphilitic embryo.

These results appear to me far more satisfactory than those heretofore reached, clinically; for, as already remarked in this paper, by such methods it cannot ~~in the first place~~ be decided, whether a syphilitic father may primarily infect the embryo, since definite proof of the mother's immunity cannot, or rather has not been had.

2. It is, and must always remain, impossible to decide when the mother has had syphilis previous to conception, whether the foetal infection takes place through the ovum, primarily, or the subsequent circulation between herself and the child.

3. Positive proof of infection is alone capable of demonstration in those cases where syphilis has been acquired by the mother at some period during her pregnancy.

There remains to be noted the following point in the consideration of syphilis transmitted to the foetus, and in it is also involved the whole subject of the pathology of specific diseases; it is this: why is it that a person, being syphilitic at the very time of impregnation, may become the parent of a healthy offspring? That such persons do beget healthy children sometimes is a fact of which almost all writers upon syphilis are cognizant, and which has appeared to be utterly inexplicable. The discovery, however, of the solid character of certain contagia, with the strong probability that that of syphilis is of the same nature, turns a flood of light upon this vexed question.

If the blood were universally pervaded with the poison-bearing principle, it would be impossible for any moist tissue in the organism to escape contamination; bones, cartilage, muscle, connective tissues, nervous system, viscera, all would be involved in the common calamity, in proportion to their moisture. That such a condition does not exist, we know, since, in their subjective and objective symptoms, not only syphilis, but all the zymotic diseases, express themselves by the selection of certain parts and certain individuals of those parts, for their special morbid manifestations. This must of necessity be so; for the universal involvement of these tissues, the various combinations of whose functions result in life, in a common and simultaneous perverted molecular motion, would be incompatible with its continuance, a fact which forces itself upon the attention in the treatment and etiology of the specific fevers; for, invariably, the powers of life succumb in these diseases in direct proportion to the intensity of the morbid action; in other words, that patient dies most certainly whose system is most intensely pervaded by the contagious

principle. Now, contemplating this question, assisted by the light thrown upon it by recent investigations, we begin to apprehend that, the contagion not being a gaseous or liquid substance, a solution of the mystery is attainable.

The solid virus is able to effect its object only when brought into actual contact with other solid particles, which, in their turn, must meet still other solid particles; thus, the contagium, not being all-pervading, cannot be brought into contact with all the tissues capable of being infected, at least at one time. Now, when we reflect that there exist strong indispositions for the parts of many individuals to assume certain morbid actions, or to be strenuously affected by such actions; considering, in particular, the sluggishness of the syphilitic virus, completing its phases in months and years, where other contagious disorders perform their changes in hours and days; it becomes easily conceivable how certain lymph-cells and leucocytes, and the descendants of these, the epithelial cells, and consequently reproductive cells, may escape the fate that has befallen their brethren; so that a single seminal discharge may consist of sperm-cells both healthy and morbid, while the Graafian follicles may contain ova of like differences.

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